Market Rule Amendment Proposal

PART 1 – MARKET RULE INFORMATION

Identification No.:	MR-00444-R00			
Subject:	Reliability-Related Information			
Title:	Connection-related reliability information			
Nature of Proposal:	☒ Alteration	☒ Deletion	☐ Addition	
Chapter:	4, 5, 11	Appendix:	Appendix 4.5A, 4.5, 4.6, 4.7,4.8, 4.9 Appendix 7.4	
Sections:	Chapter 4: 6.1.6.2, 6.6.2, 7.1.3, 7.1.4, 7.1.5. Chapter 5: 3.3.1, 3.3.2 Appendix 7.4; 1.1.1			
Sub-sections proposed for amending:	Various			

PART 2 – PROPOSAL HISTORY

Version	Reason for Issuing	Version Date
1.0	Draft for Technical Panel Review and Comment	May 19, 2020
2.0	Publish for Stakeholder Review and Comment	May 28, 2020
3.0	Submitted for Technical Panel Vote	June 16, 2020
4.0	Recommended by Technical Panel	June 23, 2020
Approved Amendment Publication Date:		
Approved Amendment Effective Date:		

PART 3 – EXPLANATION FOR PROPOSED AMENDMENT

Provide a brief description of the following:

- The reason for the proposed amendment and the impact on the *IESO-administered markets* if the amendment is not made.
- Alternative solutions considered.
- The proposed amendment, how the amendment addresses the above reason and impact of the proposed amendment on the *IESO-administered markets*.

Summary

Appendices 4.5A, 4.6, 4.7, 4.8 and 4.9 of Chapter 4 contain tables that are no longer needed. The information required since these tables were written has changed, and market participants are now required to submit this information through Online IESO. As such, these appendices can be removed. However, their removal will require changes to the defined term *reliability-related information* which refers to these appendices. Given the limited use of this defined term and the potential for conflict with sections of chapter 5, this defined term will now be renamed and redefined. Additional changes, that the IESO does not believe are material, will also be made to market manual 11, part 11.3: Reliability Information Catalogue, to reflect the removal of these Appendices, and to Chapter 5 to provide consistency between the rules and the manual.

Background

The following appendices of Chapter 4 contain tables outlining information to be provided by market participants (MPs)

- 4.5A- Generic Information (e.g. thermal ratings, relay information)
- 4.6- Generation Facilities (generation unit data, characteristics)
- 4.7- Facilities of Connected Wholesale Customers and Distributors Connected to the IESO controlled grid (e.g. load shape, motor loads)
- 4.8- Network Impact Information: Ancillary Services Providers (characteristics required to participate in ancillary services)
- 4.9 Transmission Facilities (e.g. circuit breakers)

These tables are to be removed. The information referred to through the above appendices is now collected via Online IESO as part of market registration. It may also be required during the connection assessment process. The specific data required can be found in LST-48 “Register Facility Help File” which can be found here.

The term *reliability-related information* is defined as follows;
Reliability-related information means information described in Appendices 4.1 to 4.9 of Chapter 4;

The removal of appendices 4.5A through to 4.9 will require a change to this defined term. In addition, Section 3.3 of Chapter 5 shares the same name, reliability-related information, but refers to a broader set of information required for reliability, and not just the connection assessment information referred to in the defined term. Changing the name of the term to more accurately reflect the content of the data required would reduce the potential for confusion with section 3.3 of Chapter 5.

Section 3.3.2 of Chapter 5 refers to a *catalogue of reliability-related information*. This Market Manual contains several references to the appendices that will be removed, and so will require updating. Additionally, the consistency between the market manual and market rules could be improved when referring to the direction of information flows. Specifically, the market manual is structured around two sections; reliability information provided by the IESO and reliability information required by the IESO. The opportunity exists now to revise the market rules to be consistent with the market manual and improve the clarity on the direction of the information flows.

Discussion

Chapter 4 Appendix

- Replace appendices 4.5A to 4.9 inclusive with [Intentionally Left Blank] so as to retain the numbering sequence.

Chapter 11;

- Rename the defined term *reliability-related information* to *connection-related reliability information* and replace the reference to the appendices with a reference to the connection assessment and market registration processes. Appendices 4.1 to 4.4 serve a related but separate purpose than those stipulated by section 2.2.5 of Chapter 7 and 6.1.6.2 of Chapter 4. As such they remain in the market rules, but not as part of the (re)defined term.

Chapter 4;

- Replace the reference to Appendices 4.5A to 4.9 with the newly defined term *connection-related reliability information* in the following sections;
    - 6.1.6.2
    - 7.1.3
    - 7.1.4
    - 7.1.5

Chapter 7, appendix

- Section 1.1.1; replace the reference to appendices 4.5A and 4.9 of chapter 4 with the newly defined term *connection-related reliability information*.

Chapter 5

- Revise sections 3.3.1 and 3.3.2 to refer to information provided to market participants from the IESO and information required by the IESO from market participants.

Changes to Market Manual 11, Part 11.3; will replace references to Appendices 4.5A to 4.9 with the LST-48 “Register Facility Help File”.

PART 4 – PROPOSED AMENDMENT

Chapter 11

connection-related reliability ~~related~~ information means any information provided or requested ~~described in Appendices 4.1 to 4.4 4.9 of Chapter 4 and~~ pursuant to section 2.2.5 of Chapter 7 and/or section 6.1.6.2 of Chapter 4.

Appendix 4.5A ~~– Generic Information~~ [Intentionally left blank]

~~Submission Date~~		
~~Identification~~	~~Identifier~~	
	~~Facility identifier~~	
~~Service Dates~~	~~Initial in-service:~~	
	~~Permanent in-service:~~	
	~~Permanent out-of-service:~~	
~~Protection System Description (all transmitters to provide, also generators and connected wholesale customers upon request)~~	~~A functional description of all protective schemes shall be provided to allow a detailed analysis of all credible contingencies. These descriptions shall include, but are not limited to, the following:~~ ~~Operating times for protection components (e.g. primary relaying, auxiliary relaying, communication),~~ ~~General models for normal and delayed (breaker failure) fault clearing, and~~ ~~Exceptions to the general model (e.g. LEO, HIROP).~~ ~~For all recognized contingencies, the functional description must enable fault clearing times at all terminals to be determined for both normal and delayed clearing.~~	
~~Thermal Ratings~~	• ~~For the purposes of making a connection application under section 6.1.6 of Chapter 4, a *connection applicant* shall provide the *IESO* with the transmission equipment thermal ratings as specified in Appendix 4.9.~~ • ~~Prior to placing any new or modified *connected facility* in service, a *market participant*, including *transmitters*, *generators* and *connected wholesale customers*, that own and operate transmission equipment associated with that *connected facility* shall provide the *IESO* with the equipment thermal ratings as specified in Appendix 4.4.~~	
~~Relay Information~~	~~Settings and characteristics to enable relay margin analysis of credible contingencies~~	
~~Detailed Single Line~~	~~A detailed single line diagram showing equipment and protection and telemetry points~~	
~~Test Results~~	~~Copies of all commission tests to all power system components~~	

~~*Market participants* and *connection applicants* also must provide nameplate data for equipment directly *connected* to the *IESO controlled grid* upon request.~~

Appendix 4.6 – ~~Generation Facilities~~ [Intentionally left blank]

~~Part A – Generation Facilities (Direct Connected and Embedded where Designated)~~

~~Unit Data~~	~~Identifier~~							
	~~Manufacturer~~							
	~~Serial Number~~							
	~~Type (e.g. salient pole, round rotor, induction)~~							
	~~Frequency (Hz)~~							
	~~NERC Unit type(e.g. Candu, Steam Turbine, Hydraulic Turbine, Wind Turbine)~~							
	~~NERC Status~~							
	~~NERC Cooling Water Source~~							
	~~NERC Fuel Type (primary, alternate)~~							
	~~NERC Fuel Transportation (primary, alternate)~~							
	~~Maximum Continuous Rating (summer MCR, winter MCR)~~							
	~~Capability above MCR (MW), sustainability per event (hrs)~~							
	~~Description of other restriction when operating above MCR (e.g. hours/year)~~							
	~~NERC primary fuel heat rate at full load (BTU/kWhr)~~							
	~~Rated capability (MVA)~~							
	~~Rated voltage (kV)~~							
	~~Power Factor~~							
	~~Total rotational inertia of generator and turbine (s)~~							
	~~Unsaturated reactances in pu on machine base (Xo required only if unit transformer provides a zero sequence path)~~							
	~~Xd~~	~~X'd~~	~~X''d~~	~~Xq~~	~~X'q~~	~~Xl~~	~~X2~~	~~Xo~~
	~~Unsaturated open circuit time constants (s)~~							
	~~T'do~~	~~T''do~~	~~T'qo~~	~~T''qo~~				
	~~Speed (RPM)~~							
	~~Station load (MW, MVAR)~~							
	~~Minimum power (MW)~~							
	~~Normal loading and unloading ramp rates (MW/min)~~							
	~~Emergency loading and unloading ramp rates (MW/min)~~							
	~~Armature (Ra) and field resistance (Rfd*) (Ω)~~							
	~~Saturation at rated voltage (S1.0) and 20% above (S1.2)~~							
	~~Rotational inertia for generator without turbine (s) (upon request only)~~							
	~~Damping~~							
	~~Base field current (A)~~							
	~~Base field voltage (volts)~~							
	~~Losses at 1.0 and 0.9 power factor (MW)~~							
~~Characteristics~~	~~Open circuit saturation curve~~							
	~~Short circuit curve~~							
	~~V curves~~							
	~~Capability curve~~							

~~*Field resistance for hydraulic units should be specified at 75ºC and at 100ºC for thermal units.~~

EXCITATION SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in service parameter values for the exciter. Models for stabilizers, under-excitation limiters, and over-excitation limiters shall be provided where applicable.	For each unit 10 MVA or larger

GOVERNOR AND PRIME MOVER SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in service parameters values for the governor and prime mover (turbine). More detailed models would be required if off-nominal frequency or shaft torsional studies are required.	For each unit 10 MVA or larger

Part B Embedded Generation Facilities

For each unit	Type (e.g. salient pole, round rotor, induction)	
	Rated capability (MVA)	
	Rated voltage (kV)	
	Rated power factor	
	Maximum continuous rating (MW)	
	Maximum capability under emergency conditions (MW)	
	Fuel Type	
	Emergency Ramp Rate (MW/minute)	

Part C Variable Generation (Directly Connected)

Wind Farm (WF) or Solar Farm (SF) Facilities

Wind Turbine/ PV Inverter			Type 1	Type 2
	Manufacturer			
	Model			
	Technology			
	Rated Voltage			
	Rated MVA			
	Rated MW			
	Qmax (MVAr)			
	Qmin(MVAr)			
	Xd''/Id''(pu)			
	Reactive Capability Curve		Please Attach File	Please Attach File
	Voltage Protection		Please Attach File	Please Attach File
	Frequency Protection		Please Attach File	Please Attach File
	GSU Transformer	Voltage Ratio		
		MVA		
		R(%)		
		X(%)		

	ID	Total MW	# of Type 1	# of Type 2	Equivalent Positive Sequence Impedance*			Equivalent Zero Sequence Impedance **		
					R1	X1	B1	R0	X0	R0
Collector System	C1									
	C2									
	C3									

*Reduction approach is based on equal loss criteria.

** Optional upon request.

Functional description of voltage control system	Please Attach File
Functional description of frequency control system	Please Attach File
Parameters for WF/SF dynamic model	Please Attach File
Block diagram for WF/SF dynamic model (if user defined)	Please Attach File
Source code for WF/SF dynamic model (if user defined)	Please Attach File

Appendix 4.7 – Facilities of Connected Wholesale Customers and Distributors Connected to the IESO-controlled Grid

[Intentionally left blank]

Load Schedule		Date	Peak Load	Power Factor	Load Factor					
	Commissioning		MW	%	%					
	Initial		MW	%	%					
	Ultimate		MW	%	%					
Nature of Load	Composition (e.g. % industrial, % commercial, %residential)									
	Requirement for dual supply									
	Description of unusual sensitivity to voltage or frequency fluctuations									
	Description of unusual consequences of power outages									
Power Quality Upon request	Harmonics (frequency, magnitude)									
	Flicker (voltage change, frequency)									
	Phase Imbalance (%)									
	Variable Speed Drives		Demand (kVA)		Description					
	Welding Equipment		Demand (kVA)		Description					
	Static Converters		Demand (kVA)		Description					
	Furnace		Demand (kVA)		Description					
	Other discontinuous or harmonic rich load		Demand (kVA)		Description					
	Capacitors		Demand (kVA)		Description					
	Generators		Total Size (kVA)		Description					
Load Shape		November to April (Winter) Maximum Demand			May to October (Summer) Maximum Demand					
		Weekday		Weekend		Weekday		Weekend		
	Hours (EST)	MW	MVAR	MW	MVAR	MW	MVAR	MW	MVAR	
	00:00-04:00									
	04:00-08:00									
	08:00-12:00									
	12:00-16:00									
	16:00-20:00									
	20:00-24:00									
Motors ≥ 500 HP	Type (e.g. squirrel cage, wound rotor, synchronous)									
	Rated capability (MVA or HP)									
	Power factor									
	Starting method (e.g. full voltage, resistive, reduced voltage, delta-wye)									
	Starts per day									
Induction Motors	Identifier									

≥ 25,000 HP or ≥ 500 HP per request	Rated capability (MVA or HP)	
	Rated torque (per unit on machine base)	
	Rated slip (per unit on machine base)	
	Starting torque (per unit on machine base)	
	Starting current (per unit on machine base)	
	Starting power factor	
	Peak torque (per unit on machine base)	
	Locked rotor current (per unit on machine base)	

Synchronous Motors ≥ 500 HP	Identifier							
	Rated capability (MVA or HP)							
	X''d (unsaturated subtransient reactance in per unit on machine base)							
	For each synchronous motor ≥ 5000 HP							
	Rotational inertia constant H of motor and load (s)							
	Unsaturated reactances (per unit on machine base)							
	Xd	X'd	X''d	Xq	X'q	X''q	Xl	X_2	Xo
	Unsaturated open circuit time constants (s)							
	T'do	T''do	T'qo	T''qo				
	Armature resistance (Ra) (per unit on machine base)							
	Saturation at rated voltage (S1.0) and 20% above (S1.2)							

EXCITATION SYSTEM MODEL

A block diagram suitable for stability studies or an IEEE standard model type with all in service parameter values for the exciter. Models for stabilizers, under excitation limiters, and over excitation limiters shall be provided where applicable.	For each synchronous motor 10 MVA or larger

Appendix 4.8 – [Intentionally left blank] Network Impact Information: Ancillary Services Providers

Target In-Service Dates	Initial In-Service:					
	Permanent Station In-Service:					
Reactive Support Service and Voltage Control Service	VAR Source	Type	Minimum	Min Required	Maximum MX	Max Required
Black Start Capability	Minimum Number of Starts					
	Maximum Time on In-house Load (minutes)					
	Island Governing Capability					
	Interconnected Governing Capability					
	Maximum Reactive Capability (MVAR)					
	Minimum Reactive Capability (MVAR)					
	Maximum Load Pickup Capability (MW)					
Automatic Generation Control	Maximum Power (MW)					
	Minimum Power (MW)					
	Power Ramping Rate (MW/min)					
Operating Reserve	Starting Time (for Non-synchronized Reserve only)					
	Maximum Power (MW)					
	Minimum Power (MW)					
	Power Ramping Rate (MW/min)					

Appendix 4.9 – [Intentionally left blank]

~~Transmission Facilities~~

~~Shunt Capacitors~~	~~Identifier~~	
	~~Station~~	
	~~Manufacturer and serial number~~	
	~~Rated voltage (kV)~~	
	~~Rated capability (MVAR)~~	
	~~Discharge time (ms)~~	
	~~Current limiting reactor (ohms)~~	
	~~Synchronous closing unit~~	
	~~Bank arrangement (e.g. delta, wye, double wye, etc)~~	
	~~Description of protection~~	
	~~Description of automatic switching~~	
	~~Anticipated switching restrictions~~	
~~Circuit Breakers~~	~~Identifier~~	
	~~Station~~	
	~~Manufacturer and serial number~~	
	~~Rated voltage (kV)~~	
	~~Interrupting time (ms)~~	
	~~Interrupting media (e.g. air, oil, SF$_6$)~~	
	~~Rated continuous current (A)~~	
	~~Rated symmetrical short circuit capability (A)~~	
~~Shunt Reactors~~	~~Identifier~~	
	~~Station~~	
	~~Manufacturer and serial number~~	
	~~Rated voltage (kV)~~	
	~~Rated capability (MVAR)~~	
	~~Winding configuration (e.g. delta, wye)~~	
	~~Description of protection~~	
	~~Description of automatic switching~~	
	~~Description of anticipated switching restrictions~~	

~~Transformers~~	~~Identifier~~						
	~~Station~~						
	~~Manufacturer and serial number~~						
	~~Construction (e.g. shell or core)~~						
	~~Configuration (e.g. 3 phase or three single phase)~~						
	~~Temperature rise (ºC)~~						
	~~Cooling types (e.g. ONAN, ONAF, OFAF)~~						
	~~Associated Thermal Rating for each cooling type (MVA)~~						
	~~Winter (10ºC) continuous, 15 minute and 10 day thermal ratings (A)~~						
	~~Summer (30ºC) continuous ,15 minute, and 10 day thermal ratings (A)~~						
	~~Connection for each winding H, X, Y (e.g. wye, delta, zig zag)~~						
	~~Rated voltage for each winding (kV)~~						
	~~Rated capability for each winding (MVA)~~						
	~~Impedance to ground for each winding H, X, Y (ohms)~~						
~~Impedance Test Data (see IEEE C57.12.90)~~	~~See IEEE C57.12.90 for measurement techniques~~	~~Positive Sequence Impedance (%)~~	~~HX~~		~~HY~~		~~XY~~
		~~R~~					
		~~X~~					
	~~H~~	~~MVA~~					
~~Zero sequence data is required for transformers with 1 or 2 external neutrals~~	~~H winding energized all others open~~	~~Closed tertiary zero seq. impedance (%)~~	~~H~~	~~X~~		~~HX~~	~~XH~~
		~~R~~					
		~~X~~					
	~~HX~~	~~MVA~~					
	~~H winding energized~~	~~Open tertiary zero sequence impedance (%)~~	~~H~~	~~X~~		~~HX~~	~~XH~~
	~~X winding shorted~~	~~R~~					
		~~X~~					
		~~MVA~~					
	~~In service off load tap (kV)~~						
	~~Off load taps (kV)~~						
	~~On load taps (kV) (max tap, min tap, number of steps)~~						
	~~Core and Excitation Losses (kW, kvar)~~						

~~Overhead Circuits (For each section)~~	~~Identifier~~			
	~~Terminal station(s)~~			
	~~Voltage (kV)~~			
	~~Length (km)~~			
	~~Identifier(s) and length of circuit(s) on common towers~~			
	~~Positive sequence impedance (R, X, B)~~			
	~~Zero sequence impedance (Ro, Xo, Bo)~~			
	~~Winter (10ºC) continuous and limited time* thermal ratings (A)~~			
	~~Summer (30ºC) continuous and limited time* thermal ratings (A)~~			
~~Overhead Circuits (For each segment)~~	~~Identifier~~			
	~~Length (km)~~			
	~~Distance from the "from" terminal (km)~~			
	~~Ground resistivity (ohms)~~			
	~~Identifier and length of circuits sharing the same right of way~~			
	~~Mutual impedance to other circuits (Z_{mm})~~			
~~Underground Circuits~~	~~Identifier~~			
	~~Complete steady state and dynamic electrical and physical parameters of conductors, insulators and surrounding material~~			
~~Buses~~	~~Identifier~~			
	~~Station~~			
~~Surge Arresters~~	~~Identifier~~			
	~~Station~~			
	~~Manufacturer and serial number~~			
	~~Voltage rating (kV)~~			
	~~Type (e.g. ZnO, SiC)~~			
	~~Class (e.g. secondary, distribution, intermediate, station)~~			
~~Switches~~	~~Identifier~~			
	~~Station~~			
	~~Manufacturer and serial number~~			
	~~Voltage rating (kV)~~			
	~~Type (e.g. disconnect, interrupt)~~			
	~~Continuous current rating (amps)~~			
~~Wavetraps~~	~~Identifier~~			
	~~Station~~			
	~~Manufacturer and serial number~~			
	~~Continuous current rating (amps)~~			
~~Current Transformers~~	~~Identifier~~			
	~~Station~~			
	~~Manufacturer and serial number~~			
	~~Continuous current rating (amps)~~			
~~DC Lines~~	~~Identifier~~			
	~~Complete steady state (loadflow) parameters and dynamic parameters~~			
~~FACTS Devices~~	~~Identifier~~			
	~~Complete steady state (loadflow) parameters and dynamic parameters~~			

~~*Limited time thermal ratings shall be 15 minute ratings, unless mutually agreed by the *IESO* and *market participant*.~~

Chapter 4

6. Establishing or Modifying IESO-Controlled Grid Facilities and

Connections

6.1 General Requirements

6.1.6 A *connection applicant* shall:

6.1.6.1 file a *request for connection assessment* to obtain the assessment referred to in section 6.1.5 and the approval of the *IESO* in accordance with the provisions of sections 6.1.14 to 6.1.18; and

6.1.6.2 where applicable, obtain the approval of the *IESO* pursuant to section 6.1.22.

Without limiting the generality of sections 6.1.14 and 6.1.15, the IESO shall define the form and content of information required for a *request for connection assessment*.~~, each *request for connection assessment* shall meet the requirements of section 6.1.15 and shall be accompanied by the information referred to in Appendices 4.5A to 4.9, as may be applicable, or such portion of that information as the *IESO* may allow.~~ The ~~Such~~ *connection applicant* shall notify the *transmitter* of the filing of such request for *connection assessment*.

7.1 Provision of Information

7.1.3 Each *generator* whose *generation facility* is *connected* to the *IESO-controlled grid*, *connected wholesale customer* and *distributor* connected to *the IESO-controlled grid*, and *transmitter* shall provide to the *IESO* ~~the information described in Appendices 4.5A to 4.9,~~ *connection-related reliability information* as applicable prior to placing any *connected facility* into service.

7.1.4 Each *embedded generator* whose *embedded generation facility* includes a *generation unit* rated at greater than 10 MVA and that is designated by the *IESO* for the purposes of this section 7.1 shall provide to the *IESO* ~~the information described in Part A of Appendix 4.6~~ *connection-related reliability information* as may be requested by the *IESO*.

7.1.5 Each *embedded generator* that:

7.1.5.1 participates in the *IESO-administered markets* and whose *embedded generation facility* includes a *generation unit* rated at 1 MW or higher;

7.1.5.2 is a non-market participant and whose *embedded generation facility* includes a *generation unit* rated at 10 MVA or higher,

and that is not required to provide data pursuant to section 7.1.4, shall provide the *IESO* with applicable *connection-related reliability information*. ~~the data listed in Part B of Appendix 4.6.~~

Appendix 7.4 – Transmission Information Required for Scheduling and Dispatching

1.1 Transmission Information Required for Scheduling and Dispatching

1.1.1 Full *connection-related reliability information* and transmission system data is required to be provided and updated to the *IESO* in accordance with ~~Appendices~~ Section 2.2.5 of Chapter 7 and ~~Appendices 4.5A, 4.9 and~~ Appendix 4.16 of Chapter 4.

Chapter 5

3.3 Reliability-Related Information

3.3.1 Within 90 days after the date of coming into force of this Chapter, the *IESO* shall *publish* a list of the categories of *reliability*-related information that it shall ~~make available~~ provide to *market participants*, the time periods within which such information will be provided, and the manner in which such information will be provided. Such information shall include, but not be limited to, information designed to:

3.3.2 Within 90 days after the date of coming into force of this Chapter, the *IESO* shall publish a catalogue of the *reliability*-related information that the *IESO* shall require from ~~be provided to it by~~ *market participants*, including the information referred to in section 14.1.3, the time periods within which such information will be provided and the manner in which such information will be provided. At the same time, the *IESO* shall *publish* initial monitoring indices that the *IESO* shall use in evaluating the information so provided.